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SCIENTIFIC INFORMATION REPORT

Chemistry and Metallurgy.

(22)

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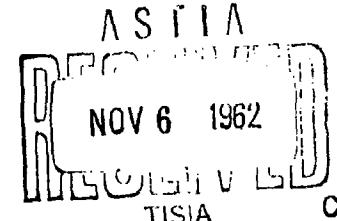
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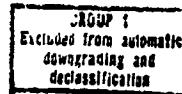
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SCIENTIFIC INFORMATION REPORTChemistry and Metallurgy (22)

This is a serialized report consisting of unevaluated information prepared as abstracts, summaries, and translations from recent publications of the Sino-Soviet Bloc countries. It is issued in six series. Of these, four, Biology and Medicine, Electronics and Engineering, Chemistry and Metallurgy, and Physics and Mathematics, are issued monthly. The fifth series, Chinese Science, is issued twice monthly, and the sixth series, Organization and Administration of Soviet Science, is issued every 6 weeks. Individual items are unclassified unless otherwise indicated.

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I. CHEMISTRY

Equipment

1. Magnetic Resonance Spectrometer Tested

"Nuclear Magnetic Resonance Spectrometer TsIA and the Results of Its Application," by A. N. Lyubimov, A. F. Varenik, and I. Ya. Slonim, Central Laboratory for Automation and Scientific Research Institute of Plastics; Moscow, Zavodskaya Laboratoriya, Vol 28, No 8, 1962, pp 991-995

Nuclear magnetic spectroscopy is being used more widely in various fields of physics, chemistry, biophysics, and other sciences. Valuable results may be obtained by using this method to study high polymers.

At the Central Laboratory of Automation, an experimental industrial model nuclear magnetic resonance spectrometer was developed for broad lines. In 1961, the laboratory assembled two models of this type, one of which is being used at the Institute of Plastics, while the other is presently being tested at the Central Laboratory of Automation.

The spectrometer consists of three basic components, viz. a magnetic system, supports for feeding the magnet with a system for regulating the temperature of the sample under analysis, and a panel for the recording apparatus.

Test results are presented on measuring broad lines under high resolution conditions for various plastics.

2. Computers Used To Design Chemical Reactors

"Volume of Information Required for the Design of Reactors by the Method of Dynamic Programming," by L. M. Pis'men and I. I. Ioffe, Scientific-Research Institute of Organic Intermediates and Dyes; Moscow, Kinetika i Kataliz, Vol 3, No 4, Jul/Aug 62, pp 493-501

The fundamentals for designing optimum conditions for chemical reactors by the method of dynamic programming on a computer are discussed. The advantages of the analytical variant of the method over that of searching are outlined. Requirements are presented on the volume of experimental data necessary to carry out the design calculations.

3. Czechoslovak Tests of New Chromatograph Completed

"Operational Tests of New Chromatograph Completed"; Bratislava, Svet Vedy, No 7, Jul 62, p 440

Personnel of the Laboratory for Analysis of Gases of the CSAV (Czechoslovak Academy of Sciences) in Brno recently completed research on the process of ionization of organic materials burning in a hydrogen flame and on separation of volatile materials in long, thin capillaries (with a diameter of 0.1 millimeters and a length of 100 meters or more). The results of this basic research were used in the design of the Chrom II high-temperature ionization chromatograph by the Laboratory Instruments Enterprise. Operational tests of this instrument have just been completed at the CSAV's work center [presumably the Laboratory for Analysis of Gases].

In comparison with the Chrom I, which is already in serial production, the new model has some significant improvements. The sensitivity of the Chrom II is 10^{-12} gram of carbon in organic materials in one second, which permits it to be used as a universal instrument with both conventional columns and modern capillary columns.

The Chrom II permits identification of some 150 hydrocarbons. The new instrument will go into production in 1963.

Medical Chemistry

4. Curareform Drugs Synthesized

"Synthesis Studies in the Field of Curareform Alkaloids IX. Synthesis of the Dimethyl Ester of Racemic Chondodendrine," by V. I. Shvets, L. V. Volkova, and O. M. Tolkachev, Moscow Institute of Fine Chemical Technology; Ivanovo, Izvestiya Vysshikh Uchebnikh Zavedeniy -- Khimiya i Khimicheskaya Tekhnologiya, Vol 5, No 3, 1962, pp 445-448

A modified method for the synthesis of the dimethyl ester of chondodendrine was developed for the purpose of further improvements in the synthesis of curareform alkaloids and to study the stereo chemistry of this class of compounds. The synthesis consists essentially of sequential building up of isoquinoline rings in seven steps.

5. Tubocurarine Esters Synthesized

"Synthesis Studies in the Field of Curareform Alkaloids X. Synthesis of the Dimethyl Esters of Tubocurarine Iodides," by V. G. Voronin, O. N. Tolkachev, and M. A. Preobrazhenskiy, Moscow Institute of Fine Chemical Technology; Ivanovo, Izvestiya Vyschikh Uchebnikov -- Khimiya i Khimicheskaya Tekhnologiya, Vol 5, No 3, 1962, pp 449-452

Four isomers of the dimethyl ester of tubocurarine iodide were synthesized and isolated. The dimethyl ester of tubocurarine iodide in which the ring is not fully closed, was also synthesized.

Organophosphorous Compounds

6. Aniline Arylamidophosphoric Acids Prepared

"Derivatives of Monoanilides of Arylamidophosphoric Acids," by G. I. Derkach, A. N. Lepesa, and A. V. Kirsanov, Institute of Organic Chemistry, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Obshchey Khimii, Vol 32, No 8, Aug 62, pp 2600-2606.

Experiments show that trichlorophosphazoaroyl compounds react with 1 gram-mole of aniline in the presence of triethylamine to form viscous, noncrystalline triethylammonium salts of anilidodichlorophosphazoaroyls, which react with formic acid or water to form crystalline chlorides of arylamidophosphoric acid anilides and monoanilides of arylamidophosphoric acids. The triethylammonium salt of anilidodichlorophosphazoaroyl are converted to anilidodiphenoxypyrophosphazoaroyls on being treated with sodium phenolate. The anilidodiphenoxypyrophosphazoaroyls are readily saponified to phenolates of monoanilides of arylamidophosphoric acids. These acids are also obtained by reacting arylamidophosphoric acid anilide chlorides with sodium phenolate. Treating triethylammonium salts of anilidodichlorophosphazoaroyls with alcohol results in crystalline alkyl esters of arylamidophosphoric acid monoanilids.

7. New Derivatives of Methylcyclohexylphosphonic Acid Prepared

"Research in the Field of the Synthesis and Conversions or Organophosphorus Compounds II. Synthesis of Some Derivatives of Methylcyclohexylphosphonic Acids," by I. A. Shikhiyev, N. I. Aliyev, and S. Z. Israfilova, Institute of Petrochemical Processes, Academy of Sciences Azerbaijan SSR; Moscow, Zhurnal Obshchey Khimii, Vol 32, No 8, Aug 62, pp 2686-2688

Oxidative chlorophosphonation of aliphatic hydrocarbons with phosphorus trichloride has been well studied. It is well known that alcohols and glycols react with phosphonic acid chlorides to form esters of phosphonic acid. In a previous work, the authors described the preparation of the dichlorides of methylcyclohexylphosphonic and methylcyclohexylthiophosphonic acids.

The purpose of the present work was to study the reactivity and chemical properties of methylcyclohexylphosphonic acid dichlorides. The following derivatives were prepared for the first time:

The bis-methyl, ethyl, propyl, and butyl esters of methylcyclohexylphosphonic acid, and the ethyl ester of methylcyclohexylphosphonic acid monochloride.

8. Fluorine-Containing Organophosphorus Compounds Studied

"Aryltrifluoromonochlorophosphides and N,N-Di-Substituted Aryltrifluoroamidophosphides", by Zh. Ivanova and A. V. Kirsanov, Institute of Organic Chemistry, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Obshchey Khimii, Vol 32, No 8, Aug 62, pp 2592-2595

It was previously shown that aryltrifluoromonohydrides of phosphorus react with chlorine to give a mixture of aryletetrahalophosphides. Further study of this reaction shows that the chlorine replaces hydrogen to give hydrogen chloride and analytically pure aryltrifluoromonochlorophosphides. These compounds are colorless liquids which are soluble in organic solvents. They give off smoky fumes in the air and etch glass. These compounds react with secondary amines to give N,N-di-substituted aryltrifluoromonochlorophosphides.

9. Optical Properties of Phosphazo Compounds Studied

"Infrared Spectra of Monomeric and Dimeric Trichlorophosphazoaryls and Phenylchlorophosphazoaryls," by I. M. Zhmuroea, A. A. Kisilenko, and A. V. Kirsanov, Institute of Organic Chemistry, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Obshchey Khimii, Vol 32, No 8, Aug 62, pp 2580-2585

The infrared spectra of triphenylphosphobenzene and triphenyl-N-ethyl-N-phenylamidophosphonium iodide were determined. According to the authors' measurements, the frequency of the nitrogen-phosphorus double bond is 1325-1385 reciprocal centimeters, and not 1160-1180 reciprocal centimeters as reported by L. Horner. The infrared spectra of monomeric Trichloro- and phenylchlorophosphazoaryl compounds contain frequencies in the 1340-1380 reciprocal centimeter range, characteristic of the nitrogen-phosphorus double bond. Investigation of the infrared spectra of benzene solutions of trichlorophosphazoaryls confirmed previously found data on depolymerization during boiling in benzene solutions of dimeric trichlorophosphazoaryls obtained from arylamides of average basicity.

10. Dialkylphosphonic Acid Amides Prepared

"Research on Derivatives of Phosphonic and Phosphonous Acid XVII. Dialkylphosphonic Acid Amides," by O. A. Mukhacheva and A. I. Razumov, Kazan Chemical-Technological Institute; Moscow, Zhurnal Obshchey Khimii, Vol 32, No 8, Aug 62, pp 2696-2699

A description is given of the preparation of dialkylphosphonic acid amides $R_2P(O)NH_2$. The amides were prepared by reacting dialkylphosphonic acid chlorides with anhydrous ammonia.

The yields did not exceed 25 percent. Separation of the products in the crystalline state was not possible owing to the instability of the products.

11. Alkylated Dialkylphosphonic Acid Amides Prepared

"Research on Derivatives of Phosphonic and Phosphonous Acids XVI. Synthesis of Alkylated Dialkylphosphonic Acid Amides," by I. A. Mukhacheva and A. I. Razumov, Kazan Chemical-Technological Institute; Moscow, Zhurnal Obshchey Khimii, Vol 32, No 8, Aug 62, pp 2693-2696

The properties of some alkylated dialkylphosphonic acid amides were described in a previous work. Among the derivatives of dialkylphosphonic acids, a number of physiologically active compounds were obtained. The present work was conducted for the purpose of further study of dialkylphosphonic acid amides and the search for new organophosphorus compounds having physiological activity. Initial amides used for the preparation of dialkylphosphonic acid amides were piperidine and morpholine.

The dialkylphosphonic acid amides were prepared by the reaction of dialkylphosphonic acid chlorides with the above cyclic amides.

The products are either crystals or viscous liquids which crystallize readily on cooling with dry ice and acetone. The amides are soluble in many organic solvents and water. Pharmacological investigation of the products will be published later.

12. Atomic Refraction of Phosphorus in Phosphine Oxides Determined

"Research on Derivatives of Phosphoni- Phosphonous and Acids XV. Atomic Refraction of Phosphorus in Phosphine Oxides," by A. I. Razumov and N. G. Zabusova, Kazan Chemical-Technological Institute; Moscow, Zhurnal Obshchey Khimii, Vol 32, No 8, Aug 62, pp 2691-2693

Most phosphine oxides prepared previously have been crystalline substances. The few liquids reported in the patent literature, lack data from which molecular refraction may be calculated. Recently, a few liquid phosphine oxides were prepared by various authors and attempts were made to determine the atomic refraction of phosphorus in these compounds. Thus, G. Kosolapoff synthesized three oxides from which he determined the atomic refraction to be 5.50.

In the present work, the atomic refraction of phosphorus was determined by a method established previously by one of the authors. This method is based on the assumption that the atomic refraction of phosphorus in esters of trivalent phosphorus increases in an ordered manner. Thus,

each substitution of an alkoxy group by an alkyl group increases the value of the atomic refraction by a constant amount equal to 0.7. This same regularity is also observed in esters of pentavalent phosphorus, where the constant is 0.52. On the basis of this relationship, the increment for atomic refraction in phosphine oxides in respect to esters of dialkylphosphonic acid must be equal to 0.52, and therefore the atomic refraction of phosphorus in phosphine oxides should be 5.31.

This assumption was checked experimentally with nine pure phosphine oxides, from which the atomic refraction has an average of 5.30, agreeing very closely with the calculated value of 5.31.

13. Halogenated Phosphine Oxides Studied

"Research on Phosphonic and Phosphonous Acids XIV. On the Reaction Mechanism of Esters of Trivalent Phosphorus With Esters of Halogenated Acids," by A. I. Razumov and N. G. Zabusova, Kazan Chemical-Technological Institute; Moscow, Zhurnal Obshchey Khimii, Vol 32, No 8, Aug 62, pp 2688-2691

Esters of phosphoncarboxylic acid are obtained by various methods. In the present work, diethylcarbethoxymethylphosphine oxide was obtained by reaction of ethyl iodoacetate with the ethyl ester of diethylphosphonous acid in ether solution. Various alkyl derivatives of diethylcarbethoxy-methylphosphine oxide were prepared. An intermediate product in the reaction between esters of trivalent phosphorus and esters of halogenated acids was isolated. This served as experimental confirmation of a mechanism for similar reactions originally proposed by A. Ye. Arbuzov and A. A. Dunin in 1914.

14. Polymeric Insecticide

"Phosphorus-Containing Polymers V. Synthesis of Polyphosphites and Polyphosphonites from Glycerine and Pentaerythrite," by K. A. Petrov, E. Ye. Nifant'yev, R. G. Gol'tsova, and L. M. Solntseva; Moscow, Vysokomolekulyarnyye Soyedineniya, Vol 4, No 8, Aug 62, pp 1219-1222 .

Polyphosphites and polyphosphonites were synthesized by trans-esterification of diethyl phosphite and diethylphenyl phosphonite with glycerol and pentaerythritol. The resulting polymers are thick, viscous liquids or glassy compounds having molecular weights ranging from 1,000 to 1500. The molecular weights may be increased further by maintaining the polymers at 175°-180° C or higher. The polymers are readily oxidized, add sulfur, or react with sulfur chlorides or disulfides. Some of the compounds contain the S,S'-ethylethylenesulfide group bound to the phosphorus

C-O-N-F-I-D-E-N-T-I-A-L

atom with a sulfur atom. These compounds are similar to systemic insecticides such as "isosystox", and it may be assumed that they possess analogous physiological activity in respect to insects and mammals. Therefore, polyphosphites and polyphosphonites may be used as plasticizers, additives to oils, and also as intermediates in the synthesis of previously unknown high molecular insecticides.

Plastics15. Phosphorus-Containing Polyesters Prepared

"Addition of Incomplete Esters of Phosphorus Acids to Unsaturated Polyesters," by A. N. Pudovik, G. I. Yevstaf'yev, and R. A. Cherkasov, Kazan State University; Moscow, Doklady Akademii Nauk SSSR, Vol 145, No 2, 11 Jul 62, pp 344-346

A study was made of the addition of incomplete phosphorus acid esters to unsaturated polyesters. The polyesters were obtained from maleic anhydride and various glycols.

Diethylphosphorous acid was added to polyethyleneglycol maleate. The reaction requires the presence of a small amount of sodium methylate. The addition product, poly-(diethylphosphon)-ethylene succinate, is a solid hygroscopic resin.

To study the possibility of partial and complete addition of incomplete phosphorus acid esters to unsaturated polyesters of high molecular weight, a series of experiments were conducted on the addition diethylphosphorous acid in various molar ratios to polydiethyleneglycol maleate having a molecular weight of 3,600. This addition was almost quantitative. Addition reactions were also successfully completed with the same polyester and diethyleneglycolphosphorous and 1,3-butyleneglycolphosphorous acids. The products of complete addition to all double bonds in the polyester were either rubber-like or solid substances. The products of incomplete addition were viscous resins.

16. Phosphorus Derivatives of Urethane Prepared

"Esters of Diphenylchloro-and Triphenylphosphazocarboxylic Acids," by V. I. Shevchenko, A. S. Shtepanek, and A. V. Kirsanov, Institute of Organic Chemistry, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Obshchey Khimii, Vol 32, No 8, Aug 62, pp 2595-2600

Esters of triphenylphosphazocarboxylic acids were obtained in high yields by the reaction of N, N, dichloro- and N, N- sodium chlorourethanes with triphenylphosphine. These esters have markedly basic properties and add hydrogen chloride to form N-carbalkoxyamidotriphenylchlorophosphorus-compounds (or N-carbalkoxyamidotriphenylphosphonium chlorides). The latter on being heated decompose into triphenylphosphine oxides, alkyl halides and polymers of cyanic acid and its esters; on hydrolysis, they yield the same products.

A normal phosphazo reaction takes place when urethanes are treated with triphenylphosphorus dichloride or diphenylphosphorus trichloride, but the resulting N-carbalkoxytriphenyl- or N-carbalkoxydiphenylchlorophosphonium chlorides do not split off hydrogen chloride. Under the

reaction conditions, the former decomposes to form triphenylphosphine oxide. The latter converts chiefly into diphenylphosphonic acid chloride, and gives off only a slight amount of hydrogen chloride and the resulting free esters of diphenylchlorophosphazo carboxylic acid which decomposes to form diphenylisocyanatophosphine oxide.

17. Organophosphorus Polymers Synthesized

"Carbon-Chain Polymers and Copolymers XLI. Synthesis, Polymerization, and Copolymerization of Amide Derivatives of Vinylphosphonic Acids," by G. S. Kolesnikov, Ye. F. Rodionova, L. S. Fedorova, T. Ya. Medved', and M. I. Kabachnik, Institute of Elemento-Organic Compounds, Academy of Sciences USSR; Moscow, Vysokomolekulyarnyye Soyedineniya, Vol 4, No 9, Sep 62, pp 1385-1389

The phenyl and ethyl esters of vinylphosphonic acid dimethylamide were synthesized for the first time. The amide derivatives of vinylphosphonic acid are shown to be capable of polymerization following a radical mechanism. Copolymers of these derivatives with styrene, methyl methacrylate, acrylonitrile, and vinyl acetate were prepared.

18. Organophosphorus Polymers Prepared by New Method

"Phosphorus-Containing Polymers IV. Synthesis of Polyphosphonates by Transesterification of Arylphosphonates With Glycols," by K. A. Petrov, E. Ye. Nifant'yev, and N. N. Novoselov; Moscow, Vysokomolekulyarnyye Soyedineniya, Vol 4, No 8, Aug 62, pp 1214-1218

Transesterification is one of the most widely known methods for the synthesis of polyesters and it is being successfully used to prepare high molecular derivatives of carboxylic acids. However, this method has not been used to synthesize polyesters of acids containing pentavalent phosphorus. In the present work, aromatic esters of methylphosphonic and phosphoric acids were prepared by transesterification of alcohols. Specifically, triphenylphosphonate, diphenylphosphonate, and o-phenylenemethylphosphonate were treated with decyl alcohol and various glycols.

The o-phenylenemethylphosphonate was the most reactive compound, indicating that steric factors are involved. The products were thick, resinous, or rubber-like masses.

19. New High-Strength Substance Developed

"Plastic Substance Stronger Than Steel"; Budapest, Figyelo, Vol VI, No 31, 1 Aug 62, p 4

The laboratory of the Chemical and Physics Institute of the Soviet Union prepared a plastic substance having low specific gravity combined with a crushing strength of 20 tons per square centimeter. Glass fibers, concentrated in the substance in accordance with the anticipated amount of strain, are used to achieve the unusually high crushing strength in the plastic substance.

20. Thallium-Containing Polymers Prepared

"Research in the Field of Coordination Polymers XIV. Reaction of Phenylthallium Diisobutyrate With Dicarboxylic Acids and Their Derivatives," by V. V. Korshak, S. V. Rogozhin, and T. A. Makarova, Institute of Elemento-Organic Compounds, Academy of Sciences USSR; Moscow, Vysokomolekulyarnyye Soedineniya, Vol 4, No 8, Aug 62, pp 1137-1141

Thallium-containing polymers were prepared by treating phenylthallium diisobutyrate with dicarboxylic acids. The polymers obtained from adipic, azelaic and sebaciec acids are white powders which are much more soluble in organic solvents such as benzaldehyde, nitrobenzene, and acetic acid, than corresponding products obtained from dicarboxylic acids and divalent metals. It was found that the presence of hydroxyl groups in the alpha-position to the carboxyl groups of the dicarboxylic acids results in a decrease in the solubility of the polymers.

Radiation Chemistry

21. Method for Extraction of Technetium-99

"Extraction of Technetium With Acetone," by A. F. Kuzina, Ts. Tagil', N. N. Zamoshnikova, and Academician V. I. Spitsyn; Moscow, Doklady Akademii Nauk SSSR, Vol 145, No 1, 1 Jul 62, pp 106-108

Literature data indicate that methyl ethyl ketone and methyl isobutyl ketone may be used to extract technetium-99 from solutions obtained when treating molybdenum with neutrons. Acetone would be an excellent solvent for extraction of technetium-99 were it not for its total miscibility with water.

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The authors established that sodium molybdate and sodium hydroxide are salting-out agents for acetone in aqueous solutions. Therefore, by using alkaline solutions, it is possible to selectively extract technetium with acetone in the presence of other radioelements. An extraction method, based on this principle, was subsequently developed. The neutron-irradiated molybdenum metal is oxidized with nitric acid to convert the technetium into the heptavalent state. The product is evaporated to dryness and then dissolved in a mixture of sodium hydroxide and hydrogen peroxide. Sodium hydroxide is then added until the alkalinity is 2-3N. The technetium is extracted from this solution with acetone.

Spectrum analysis shows that even after the first extraction, radiochemically pure technetium-99 is obtained. The acetone also selectively separates it from a number of other radioactive isotopes, commonly present in irradiated molybdenum.

22. Sorption of Fission Products by Soils and Clays Studied

"Sorption of Long-lived Fission Products by Soils and Clay Minerals," by Yu. A. Koktov and R. F. Popova; Moscow, Zhurnal Prikladnoy Khimii, Vol 35, No 6, Jun 62, pp 1242-1245

A study was made of the sorption of Sr⁹⁰, Cs¹³⁷, and Ce¹⁴⁴ by soils and clays of the USSR. Sorption was characterized by a coefficient of distribution K_d which determined the selectivity of the sorbent under the experimental conditions in respect to the given ion: $K_d = G/S$, where G is the amount of a given ion in gram equivalents adsorbed on 1 kilogram of sorbent, and S is the equilibrium concentration of this ion in solution in gram equivalents/liter. Coefficients of distribution for the above isotopes were determined for six soils and two clays and plotted against pH.

Experiments show that soils and clays having a large exchange capacity are the best sorbents for Sr⁹⁰. In neutral and slightly alkaline solutions, sorbents having minimum quantities of calcium salts have the highest selectivity.

The sorption of Cs¹³⁷ has a maximum value at pH 6-8. Under ordinary conditions, Ce¹⁴⁴ is sorbed readily. In acid solutions, sorption of Ce¹⁴⁴ is diminished. The sorption of this isotope is also diminished in the alkaline region owing to transition of the Ce⁺³ ion to another form.

The above isotopes are all uranium and plutonium fission products.

Miscellaneous

23. Water Conservation by Retardation of Evaporation

"How To Cover the Sea"; Ashkhabab, Turkmeneskaya Iskra, No 124 (10934), 27 May 62, p 4

"The level of the Caspian Sea can be preserved by covering it with a thin film to decrease evaporation.

"Fantasy? Not entirely -- such a film already exists. Two reports on this subject were presented in Tashkent at a meeting of the Commission for Utilization of Ground and Water Resources of Central Asia and Kazakhstan.

"Tass correspondent Yc. Yefilb asked the authors of these new studies, Candidate of Technical Sciences Valentina Serguyevna Makarova of the All-Union Scientific-Research Institute of Hydrotechnology and Melioration and Doctor of Technical Sciences Andrey Karpovich Ananyan of the Institute of Water Problems, Academy of Sciences Armenian SSR to answer some questions.

"How thick must the coating be to retard evaporation? "This is the easiest question,' smiled Valentina Serguyevna. 'A thickness of one molecule.'

"This is not a coating, but rather a protection,' added Andrey Karpovich. 'It may be made up of large molecules, each of which is anchored to the water molecules. And the more dense the protection, the better the water volume is covered.'

"What kind of matter is required for this purpose? "The selection is large,' noted Valentina Serguyevna. 'The US has published a list of 152 film-forming substances based on animal and vegetable fats. We also passed through this stage of research. The most valuable fats were tested, but this was not profitable. First of all, edible fats can find direct application. Second, inhabitants of the water showed a great interest to such films -- they used it as food.'

"It became necessary to use other films,' concluded Valentina Serguyevna. With the assistance of chemists, Corresponding Member Academy of Sciences USSR A. Petrova and Prof A. Trapeznikova selected surface active agents made from petroleum products. They are no less effective than the best of foreign film-formers, and at the same time they are cheaper.'

"How does one compare the effectiveness of films? They are invisible.'

"'The films, indeed, are entirely transparent,' agreed Andrey Karpovich, 'but their activity may be discerned with the naked eye. It is only necessary to pour some of the film-forming substance out on water on which shavings are floating. The shavings are rapidly pushed to one side. And not only shavings -- a layer of this substance, whose presence may be surmised, suppresses small waves, moving along the surface.'

"'But the readers should not get the impression that in our experiments we depend only on guesses,' remarked Valentina Serguyevna. 'We have instruments which not only detect the presence of films, but also measure its surface tension, despite the fact that we are dealing with extremely small magnitudes.'

"'Is it possible to weigh these coatings?'

"'This is done beforehand. The dosage of a film-forming substance is determined in relation to the conditions of the experiment. For example, by using 0.04 gram per square meter of surface daily, it is possible to decrease evaporation by 15 percent.'

"'There were some experiments in which this index was increased to 50 percent. The film may be controlled by various methods, including automation which takes cognizance of the temperature of the air, water, wind, and waves. Even with minimum results, the expense are recouped many times.'

"'In Tselinniy Kray, for example, where experiments were conducted, there are 11,300 fresh water lakes. Each year 9 cubic kilometers of water is evaporated from their surfaces. Conservation of 15 percent will result in over 1,350,000 cubic meters of water, enough to meet the needs of hundreds of thousands of people.'"

24. Brief Historical Review of Military Academy of Chemical Defense

"The Military Academy of Chemical Defense is Thirty Years Old,"
Moscow; Voyenne-Istoricheskiy Zhurnal, No 5, May 62, pp 126-127

"Thirty years ago, on 13 May 1932, the Military Academy of Chemical Defense was established to prepare highly qualified military chemists capable of rendering dependable antichemical defense to troops.

"The academy was founded on a base of three institutions of learning: the Moscow Chemical-Technological Institute, the Chemical Faculty of the Military-Technical Academy, and the Higher Military-Chemical School.

"The party and Soviet government directed important scientists and specialists in various fields of knowledge to work at the academy. Behind its walls during prewar years, educational and scientific work was conducted by the following scientists and teachers: A. I. Gotovtsev, M. M. Dubinin, M. M. Zagyu, L. L. Klyuyev, I. L. Knunyants, L. K. Lepin', B. V. Nekrasov, L. V. Ravushkevich, P. G. Sergeyev, S. I. Sklyarenko, K. V. Chmutov, G. M. Berman, and many others. Under their direct participation before the beginning of World War II, the academy prepared many hundreds of specialists for the armed forces and the national economy. In its laboratories and offices was conducted much work of great significance for defense and the national economy. In prewar years, scientists of the academy published many scientific works, many of which were distributed widely (Obshchaya Khimiya [General Chemistry] by B. V. Nekrasov, Khimiya i Tekhnologiya BKhV, [Chemistry and Technology of BKhV], by L. Z. Soborovskiy and G. Yu. Epshteyn, Sredstva Zashchity ot OV [Means for the Defense Against OV] by A. Kh. Mel'nikov, Uchebnik po Tylu [Textbook for the Rear] by M. M. Zagyu, Fizicheskiye i Fiziko-Khimicheskiye Osnovy Vojenno-Khimicheskogo Dela [Physical and Physico-Chemical Fundamentals of Military-Chemical Matters] by N.N. Sveshnikov and S. I. Sklyarenko, a number of works on higher mathematics by G. N. Berman and others).

"The academy suffered a serious loss as a result of disruption of a revolutionary law during the period of the cult of personality. Many leaders were torn, from the ranks of its workers, including scientists and teachers, being accused of very grave crimes against the country with no basis. They included the First Head of the Academy, Ya. L. Avinovtakiy, Professor P. G. Sergeyev, S. A. Vozsenskiy, Military Historian A. N. de Lazari, G. Yu. Epshteyn, and other comrades who were subsequently fully exonerated.

"The great Patriotic War of the Soviet Union against the fascist occupiers came as a servere task for our country and its armed forces. The Military Academy for Chemical Defense conducted much work during the war years, although the Hitlerites did not dare to use chemical weapons. From the first days of the war, a considerable part of the instructors from the academy went on active duty in the army.

"The academy teachers displayed courage and heroism in battles for our country, and showed unwavering determination in carrying out their patriotic military duty. Many of them gave their lives for our country.

"The Soviet government fittingly valued the military activity of the teachers and instructors of the academy on the front lines of the great Patriotic War, honoring them with high state decorations. Many units of chemical defense commanded by former students of the academy, were decorated with combat orders.

"In the postwar years, the academy as well as higher military institutions of learning faced new complex problems. This made it necessary to reconstruct teaching programs, redirect the preparation of students, and research works of the chairs of the academy.

"During 30 years of its existence the academy produced 46 doctors and over 200 candidates of science. The work and the scientific discoveries by scientists of the academy received the highest recognition -- the Soviet government acknowledged them with state prizes.

"Inspired by the historic decisions of the 22d Party Congress, the faculty, students, workers and employees of the academy unified by the party organization, approached its 30th year with solid resolution to do everything to successfully fulfill the tasks set before them."

25. Organic Chemistry Versus Inorganic Chemistry in Space Ship Construction

"Chemistry and Outer Space, Academician I. Tananayev Answers Komsomolskaya Pravda"; Moscow, Literaturnaya Gazeta, 1 Sep 62

"Who of us has not, from childhood years to a venerable old age, been interested in visiting the planets of the solar system, worlds removed from us by tens and hundreds of light years? I am certain that mankind is not alone in the universe and that somewhere else there live and work our brothers in spirit, reasonable creatures who strive for the same goal as we do, namely, to create a life that will be as rich, interesting, and full of creative endeavour as possible.... I am certain that there are reasonable creatures who have advanced very far along the road of progress and that there are such as lag behind us. Some need our aid; others seek an opportunity to help us. I am convinced that soon mankind will enter into direct contact with the reasonable creatures of other worlds, in the epoch of the Great Ring, which has been described with amazing artistic force in the "Andromeda Nebulae," by I. Yefremov. This belief of mine is an inexhaustible source of inspiration for work on the intricate problems which nature, for the first time in the history of science, sets before people....

Question: Which chemical achievements might, in your opinion, be of greatest significance for space flights?

Reply: That is an intricate question inasmuch as there is hardly a branch of chemistry which is not called upon during the preparations for and the making of space flights. It is known, for instance, that due to the cosmic velocities of the flight, the ship's surface heats up very much as a result of friction with the air. The trouble is that the metal from which the body of the ship is made is an excellent conductor of heat, and it can not only sweat, but it can also greatly raise the temperature in the interior compartments. It is here that chemistry renders its help by creating various types of substances that possess great thermic stability and low heat conductivity.

Question: But even the most heat-resisting substances can withstand a temperature of 2,200 deg C for only a few seconds.

Reply: That is so, but they possess very low heat conductivity. During the flight through the dense strata of the atmosphere, only a very thin outer layer of the jacket becomes heated. When it burns out, the next layer becomes heated. Thanks to the low heat conductivity, the jacket does not burn up all at once, but gradually, layer by layer.

Question: The production of heat-resisting substances involves considerable difficulties, doesn't it?

Reply: Thermically stable substances are used not only in cosmonautics, and the technology of their production has been most thoroughly developed. In particular, the chemical industry uses, for these purposes, asbestos and graphite as fillers for phenolic resins. That is not so intricate or expensive. We may employ not only phenolic resins to obtain thermally stable plastics that are used in the most diverse branches of industry. Plastics based on organosilicon compounds, some of which can withstand briefly temperatures under which some metals melt and even boil, can also be used.

Question: How stable are such plastics?

Reply: There are some special plastics which, for their stability, are not inferior to steel and light special alloys. They are already being widely used in various branches of engineering. This may be achieved, for instance, by introducing into a polymer a glass fibre of fine diameter, about 15 thousandth of a millimetre. From one cubic centimeter of glass it is impossible to draw out a thread with such a diameter over 5 km long. If this glass fibre is properly situated, saturated with polymeric resins, and compressed under heat, very stable materials can be obtained, which we call reinforced plastics.

Question: Why can fragile glass contribute such stability to plastics?

Reply: The reason lies in the anisotropy of the structure. To break a one sq cm wooden bar across the grain one needs to exert 800 - 1,000 kg of effort. But in order to break it longitudinally, only 30-40 kg of effort are needed. We say that a body which has different properties (stability, resiliency) when tested along axes in different directions has an anisotropic structure, and that which has the same properties in the same directions -- an isotropic structure. Man has long taken advantage of this property (for instance, when making plywood). But a method was found to make materials that possess even greater anisotropic properties. The finest glass fibers have proven to be amazingly durable: for instance, a thread-like quartz fiber with a diameter of 3 - 6 microns is more than 300 times as durable as that same quartz glass in a solid piece and 15 times more durable than high-grade steel.

Question: Can even greater stability and heat resistance be obtained?

Reply: Yes, they can, but not from organic polymers. Under conditions of high and super-low temperatures, vacuum, and weightlessness, organic compounds will have to give way to purely inorganic ones, and in this case it is inorganic chemistry that will have the decisive word. Thus, alloys based on carbides of certain rare elements will make it possible to obtain materials with melting points of over 5,000 degrees C.

Question: Outer space can expect all of this from chemistry. Won't you tell us what the chemists can expect from outer space?

Reply: Outer space is a wonderful natural laboratory where there are such conditions that we, terrestrial scientists, can only dream of. I am convinced that the work of chemists in space laboratories will enrich our terrestrial chemistry with new, remarkable discoveries."

26. Development of Chemical Engineering Training in Czechoslovakia

"Chemical Engineering in Czechoslovakia," by Engr Jan Novosad; Prague, Technicke Noviny, Vol 10, No 35, 29 Aug 62, p 3

The article reviews the development of chemical engineering training in Czechoslovak advanced schools and the process whereby chemical engineering came to be recognized as an independent field of research in Czechoslovak research facilities, culminating with the 1959 establishment of the chemical engineering facility of the Czechoslovak Academy of Sciences. According to the article, this facility is now a part of the Institute for the Theoretical Principles of Chemical Technology (Ustav teoretickych zakladu chemicke techniky). This facility, one of the most important research establishments in Czechoslovakia, is engaged in fundamental chemical engineering research involving physical processes as well as problems connected with chemical reactors. (FOR OFFICIAL USE ONLY) (COPYRIGHT, 1962 [presumably by the Central Council of Trade Unions, the publisher])

27. Combustion Kinetics of a Powder Studied

"On the Theory of Combustion of a Model Powder Mix," by B. V. Novozhilov, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Zhurnal Fizicheskoy Khimii, Vol 36, No 8, Aug 62, pp 1803-1806

A discussion on the combustion process of particles in a model powder mixture in which the components differed markedly from each other in physical and thermal properties, ascribes very low theoretical combustion velocity. The calculated value differs from experimental data by several orders of magnitude. This places under doubt a previously published mechanism of combustion for powder mixtures presented by the authors where it was assumed that flaming takes place at any temperature of the gas phase.

28. New Arsonium Compound Prepared

"Reaction of Trialkylarsine Oxide With Alkyl Halides," by Gil'm Kamay, P. D. Chernokal'skiy, and L. A. Vorob'yeva, Kazan Chemical-Technological Institute; Moscow, Doklady Akademii Nauk SSSR, Vol 145, No 2, 11 Jul 62, pp 328-329

Recently, attempts have been made to study and synthesize complexes of tertiary arsine oxides with compounds containing atoms with incomplete electron orbits. In the present work, a study was made of the possibility of reaction between trialkylarsine oxides and alkyl halides. The reaction was conducted in anhydrous benzene and resulted in a crystalline product having a melting point of 146° - 147°C. The product was readily soluble in polar solvents and insoluble in nonpolar solvents. Analysis showed the product to be triethyl-(triethyloxyarsoxy)-arsonium iodide. Conductivity measurements showed that this substance is a strong electrolyte. The degree of electrolytic dissociation of the product indicates that a strong polar or even ionic bond exists between the arsenic and iodine atoms. On substitution of isobutyl iodide in place of isopropyl iodide, the same product was obtained. Apparently, an intermediate product is formed which decomposes to the above product.

29. E.P.R. Spectra Used To Determine Structure of Organic Compounds

"Studying the Structure of Organic Compounds Using the Electron Paramagnetic Resonance Method," by Corresponding Member of the Academy of Sciences G. A. Razuvayev, M. L. Khidekel' and V. B. Berlina, Scientific-Research Institute of Chemistry at Gor'ky State University; Moscow, Doklady Akademii Nauk SSSR, Vol 145, No 5, 11 Aug 62, pp 1071-1074

A study was made of the possibility of using the stability of free radicals as a method for studying the structure of organic compounds. The stability of radicals is taken to mean the half-life period of a radical in an inert medium or in a model type reaction at a given temperature.

According to the proposed method, the structure of an organic compound is reduced to radicals whose stabilities are compared with the stabilities of radicals of known structure. The radicals under comparison must differ by one of the factors which determine stability. The half-life period, being such a factor, is readily determined by the method of electron paramagnetic resonance (E.P.R.). The feasibility of this method was tested by determining the structure of the condensation product resulting from the reaction of acetone with aniline, ter-butyl naphthol-2, and triphenylmethyl naphthol-2

Conferences

30. Next Conference on Electrochemistry of Organic Compounds in 1964

"Electrochemistry of Organic Compounds," by L. G. Feoktistov and Candidate of Technical Sciences M. Ya. Fioshin; Moscow, Vestnik Akademii Nauk SSSR, No 8, Aug 62, pp 123-124

The Fourth Conference on the Electrochemistry of Organic Compounds, sponsored by the Institute of Electrochemistry of the Academy of Sciences USSR and the Electrochemistry Section of the All-Union Chemical Society imeni D. I. Mendeleev, was held on 28-30 March 1962 in Moscow. It is noted that the next conference on this subject is planned for the first part of 1964.

II. METALLURGY

Brazing and Welding31. Coating Titanium Alloys for Brazing to Aluminum Alloys

"Coating Alloy OT-4 With An Aluminum Layer in the Development of Processes for Brazing Titanium Alloys to Aluminum Alloys," by Yu. S. Dolgov, D. L. Khadzhi, and V. L. Grishin; Moscow, Tsvetnyye Metally, No 5, May 62, pp 66-70

Techniques employed in coating titanium alloy OT-4 with aluminum for subsequent brazing to aluminum alloys are described. It is established that the best results are achieved by holding the titanium material in molten AVO-grade aluminum (under a F380-type flux to prevent oxidation) at 800° C for 30-40 sec. Specimens treated under these conditions (1.5 mm-thick OT-4 with a 0.02-0.04 mm-thick layer of AVO aluminum) bend tested to 60-70° with no peeling. It is claimed (however, no data are given) that high-strength brazed joints were obtained with aluminum alloys of various systems.

32. Rhenium-Alloyed Weld Joints of Molybdenum

"Welding of Molybdenum With Alloying of the Weld Joint Metal With Rhenium," by Candidate of Technical Sciences V. V. D'yachenko and Engr B. P. Morozov, Moscow Aviation Technological Institute; and M. A. Tylkina, Candidate of Technical Sciences, and Ye. M. Savitskiy, Doctor of Chemical Sciences, Institute of Metallurgy imeni A. A. Baykov; Moscow, Svarochnoye Proizvodstvo, No 7, Jul 62, pp 1-4

Tests on argon-arc welding of thin-sheet molybdenum (0.7-1 mm thick) and VM-1 sheet (one mm thick) with rhenium wire and a rhenium alloy wire containing 50% Re and 50% Mo are discussed. Highest weld joint ductility was exhibited by weld joints containing approximately 50% Re. The rate of oxidation of joint metal containing up to 50% Re in air at 300-5000° C is approximately the same as that of molybdenum.

33. Welding Aluminum Alloys to Steel

"Method of Joining Aluminum to Steel," by F. I. Razduy, Candidate of Technical Sciences, and Engr V. P. Sitalov; Moscow, Svarochnoye Proizvodstvo, No 7, Jul 62, pp 12-15

Procedures in the preparation and rolling of bimetal strip made of Armco iron and aluminum (Al, A3, AMg3 and AMg5V grades) are described. The thickness of the aluminum layer in the finished strip specimens ranged from 2.2 to 4.1 mm, and the thickness of the Armco iron, from 2.1 to 3.3 mm. Sections of bimetal material of predetermined size were placed at the location for joining Armco iron and aluminum parts in such a way that like metals were in contact. Wire made of Amg5V was used to form the aluminum joint and wire SV-08G2SA, to form the iron joint. Results are given of mechanical tests of various welded designs. In most cases rupture occurred outside the bimetal insert zone.

Patents

34. Recent Soviet Patents in Field of Metallurgy

I. "Authorship Certificates"; Moscow, Byulleten' Izobreteniy, No 12, Jun 62

Class 7a, 902. No 147987. M. P. Lednev, Sh. G. Guterman, M. S. Selivanov, and M. A. Benyakovskiy, "Method of Fabricating Cold-Hardened Strip Made of Stainless Steel Grades Ya-1 and Ya-2."

Class 12c, 2. No 148017. I. N. Tsigler, S. A. Fayvusovich, and Yu. K. Gulevich, "A Furnace for Equipment for Growing Single Crystals of Refractory Substances."

Class 18b, 23. No 148075. I. D. Abramson and I. V. Chebotarevskaia, "Method of Making Molds for Casting Items From Aqueous Suspensions of Metal Powders (dross)."

Class 18c, 1. No 148076. M. L. Bernshteyn and A. G. Rakhshtadt, "Method of Obtaining High Strength for Metals and Alloys."

Class 21h, 2913. No 148166. D. A. Dudko, B. Ye. Paton, I. N. Rublevskiy, and G. S. Tyagun-Belous, "Method of Electroslag Welding."

C-O-N-F-I-D-E-N-T-I-A-L

Class 21h, 30₁₂. No 148167. V. M. Funtikov, "Torch for Argon-Arc Welding."

Class 21h, 30₁₂. No 148168. A. M. Polnarev, "Arc Method of Spot Welding in Protective Gases."

Class 21h, 30₁₆. No 148169. V. S. Semina, Ye. V. Sokolov, P. B. Ladyshinskiy, P. D. Skorokhod, I. S. Kumysh, and V. A. Bogolyubov, "Alloying Composition of a Coating for Welding Electrodes."

Class 21h, 30₁₆. No 148170. F. G. Gonserovskiy, "Electrode Coating." [For EI-925 rods]

Class 21h, 30₁₆. No 148171. I. K. Pokhodnya, V. N. Shlepakov, and A. M. Suptel', "Charge for a Powder Wire." [Welding wire]

Class 31c, 8₀₇. No 148205. I. I. Lupyrev, S.-K. S. Dreer, Ya. M. Dityatkovskiy, I. P. Zarutskiy, P. R. Kuratov, and M. V. Sladkova, "Pattern Composition for Investment Casting."

Class 40a, 46₅₀. No 148239. O. N. Magnitskiy, E. Ya. Kukkonen, and L. M. Postnov, "Crucible (Expendable) for Melting Refractory Metals and Alloys."

Class 40b, 20. No 148243. M. Ye. Drits, Z. A. Sviderskaya, and L. L. Rokhlin, "Deformable Magnesium Alloys." [1.0-4.0% Nd, 1.0-2.5% Mn, 0.1-0.4% Ni with 1-4% Cd added]

Class 46g, 10. No 148302. V. M. Ivanov, "Method of Depositing a Layer of Erosion-Resistant Material of Variable Thickness on the Working Surface of a Jet Nozzle." [Flame-spray coating of interiors of nozzles, as in rocket engines]

Class 48a, 1₀₄. No 148312. I. N. Rubtsov and A. I. Tatarenkov, "Nozzle for Etching and Deposition With an Electrochemical Jet."

Class 48a, 6₀₅. No 148314. "Method of Dressing Aluminum and Its Alloys for Chemical Nickel Plating."

Class 48a, 16₀₁. No 148316. B. I. Morozov, "Method of Fine Electrochemical Machining of Metallic Items."

Class 48b, 11₀₃. No 148317. A. I. Zyukov, B. D. Povolotskiy, M. L. Denenberg, Ye. B. Fuks, V. F. Gol'nev, and U. I. Omerov, "Vacuum Equipment for Depositing Multilayer Coatings." [metallic and nonmetallic]

Class 48b, 13. No 148318. B. N. Arzamasov and D. A. Prokoshkin, "Method of Saturating Refractory Metals in a Gaseous Medium of, for Example, Aluminum, Silicon, or Zirconium."

Class 48d, 1. No 148320. I. I. Kalinichenko, G. V. Kashiro, Ye. M. Lekarenko, G. N. Pokrovskaya, and I. F. Bogomolova, "Method of Removing Scale From Items Made of Nickel and Its Alloys."

Class 67a, 9. No 148338. A. S. Krasnyanskiy, G. M. Karachun, I. I. Knyazhitskiy, and V. L. Shlafer, "Vertical Fixed Mill for Honing Precision Holes of Small Diameter and Length."

II. "Authorship Certificates"; Moscow, Byulleten' Izobreteniy, No 13, Jul 62

Class 7b, 14₅₀. No 148373. V. N. Parusnikov, Yu. A. Sokolov, T. A. Kirsanova, L. P. Malikova, and R. I. Natapova, "Method of Metal Coating for Subsequent Drawing of Wire Made of Metals Having the Property of Sticking to Dies Made, for Example, of Tantalum."

Class 18c, 1. No 148423. M. V. Poplavko and N. N. Manuylov, "Method of Fabricating Hollow Welded Metallic Vessels."

Class 18c, 1₃₀. No 148424. M. L. Bernshteyn, N. N. Pekalov, and A. S. Nikishov, "Method of Strengthening Parts Made of an Austenitic Heat Resistant Steel."

Class 18c, 3. No 148427. V. I. Prosvirin, I. F. Zudin, and A. N. Myasoyedov, "Method of Diffusion Alloying the Surfaces of Parts With Metals."

Class 18c, 3. No 148428. I. Ye. Kontorovich and M. Ya. L'vovskiy, "Method of Increasing the Heat Resistance of Steel Items." [coating with beryllium]

Class 40a, 46₄₀. No 148521. Ye. M. Savitskiy and V. V. Baron, "Method of Refining Vanadium."

Class 40c, 15. No 148525. O. A. Lebedev, K. D. Muzhzhavlev, N. M. Yelin, and G. P. Khristyuk, "method of Refining Magnesium Alloy Scrap."

Class 48a, 1₀₄. No 148700. V. M. Kochegarov and V. A. Slivina, "Method of Etching Germanium."

Class 48a, 15₀₃. No 148702. V. I. Chugreyev, V. S. Yekaterinini, and V. I. Shirayev, "Assembly Line Electroplating of, for Example, Nickel."

Class 80b, 13₀₃. No 148746. R. M. Manelis, "Molybdenum-Base Paste." [for brazing high-alumina ceramics to stainless and carbon steels]

35. Electron-Beam Gun for Refining Metals and Alloys

"Electron-Beam Melting"; Moscow, Ekonomicheskaya Gazeta, 8 Sep 62, p 36

Current of 3-5 amps at a working voltage of 14 kv and electrostatic focusing of the electron beam to the desired specific power are possible, it is claimed, with a new device for electron-beam melting of metals and alloys in a vacuum. B. Movchan, a senior associate of the Institute of Electric Welding imeni Ye. O. Paton, was awarded an Authorship Certificate for this invention. The device contains a cathode with a tungsten filament, a water-cooled anode with an opening for passage of the beam, and a mechanism for moving the anode relative to the cathode for beam focusing. The anode and cathode are in the form of concentrically arranged rings with an annular opening for passage of the electron beam, a design which is claimed to be unique in engineering. The only additional information given is in the form of a cross-sectional sketch of the gun showing the main components.

36. Lubricant for Hot Extrusion

"Lubricant for Hot Extrusion"; Moscow, Ekonomicheskaya Gazeta, 8 Sep 62, p 36

A lubricant for which an Authorship Certificate was awarded to V. Povarov and B. Roschupkin was tested at the Central Scientific-Research Institute of Technology and Machine Building in hot extrusion (1,180°C) of compressor blade forgings made of steel EI961. It is claimed that the blade surface quality is satisfactory, the deformation force required is approximately the same as with a graphite-oil lubricant, and the extrusion process is not accompanied by fumes or flame. The lubricant is made of a mixture of two parts graphite by weight and one part burnt soda to which water is added until a doughlike mass is formed. This mass is rolled and then cut into 25- to 30-gram pieces. One such piece is used for each extrusion.

37. New Patented Rolls in Operation at the Dnepropetrovsk Metallurgical Plant

"Long-Life Rolls": Moscow Ekonomiceskaya Gazeta, 18 Aug 62, p 43

Heavy rails are now being rolled on one of the mills of the Dnepropetrovsk Metallurgical Plant, which is equipped, it is claimed, with new long-life rolls which were manufactured by a patented process developed by A. Farshin, I. Anisaykin, A. Robustov, N. Cherkun, M. Knyazhanskiy, M. Pavolotskiy, V. Latyshev, and P. Chepelev. The working layer of these new rolls has a Shore hardness of 50-58 units as compared to the 30-50 units of ordinary rolls. Productivity of the mill with the new rolls is increased 10%; cost of the new rolls is 17 rubles less than that of other types.

The iron used in the new rolls is of a high-carbide-forming type which contains 2.6-3.3% C, 0.4-0.9% Si, 0.2-0.5% Mn, up to 0.3% P, 0.4-1.0% Cr, and up to one % Ni. No magnesium is used for modification. Casting is accomplished in a two-piece profiled shell mold, the inner surfaces of which are coated with a compound containing a zirconium concentrate. In the pouring process, 0.05-0.1% silicon is added in the form of crushed ferrosilicon.

Phase Diagrams

38. Alloys of the Nb-Mo-W System and Their Properties

"Fusibility Diagram and Properties of Alloys in the Nb-Mo-W System," by Ye. M. Savitskiy, V. V. Baron, and K. N. Ivanova; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Metallurgiya i Toplivo, No 2, Mar/Apr 62, pp 119-125

Construction of a fusibility diagram for the Nb-Mo-W ternary system and a study of the properties of the alloys formed in this system were of primary interest in this present work.

Among the properties studied were hardness at 200°C and the hot hardness of some of the alloys at 1,000°C, oxidation resistance at 1,200°C, and plasticity at room temperature.

Unlimited solubility of the components of the ternary system in the liquid and solid state was found to exist, and it was also noted that the melting point of the alloys containing tungsten decreases proportionally from 3,200°C to 2,400°C with decreasing tungsten content. Alloys containing 70-90% niobium have a minimum weakening at 1,000°C.

Optimum oxidation resistance was observed in binary alloys with 10-15% (by weight) molybdenum and 15-30% tungsten (by weight) in a niobium matrix, while in ternary alloys the best resistance was exhibited by alloys containing 10% molybdenum and 20% tungsten (by weight) in the niobium matrix. From this study, it was felt that alloys of this system in the niobium corner are best suited for applications at elevated temperatures.

39. Alloys of the W-C-Co-Mo System

"Alloy Structure and Properties of the W-C-Co-Mo System," by V. F. Funke, T. A. Novikova, and V. I. Tumanov, All-Union Scientific-Research Institute of Hard Alloys; Moscow, Izvestiya Akademii Nauk, SSSR, Otdeleniye Tekhnicheskikh Nauk, No 2, Mar/Apr 62, pp 113-118

The phase composition and structure of alloys containing 80% and 47% tungsten in the W-C-Co-Mo system, as well as the influence of carbon and molybdenum content on certain properties, were investigated.

In the W-C-Co-Mo system, there exists a region with molybdenum and carbon in solid solution with tungsten carbide. The hardness of alloys of this system containing 3% molybdenum at room and elevated temperatures surpasses alloys of equal strength in the W-C-Co system by 100-200 kg/mm². The strength of the alloys of the two systems is approximately the same, but at 800°C the strength of the alloys of the W-C-Co-Mo system is greater than those of the W-C-Co system.

40. Rhodium-, Palladium-, Iridium-Rhenium Alloy Phase Diagrams

"Phase Diagrams of Rhenium Alloyed With Metals of the Platinum Group (Rhodium, Palladium, and Iridium)," by M. A. Tylikina, I. A. Tsyganova, and Ye. M. Savitskiy; Moscow, Zhurnal Ne-organicheskoy Khimii, Vol 7, No 8, Aug 62, pp 1917-1927

Much interest is being shown in the use of rhenium alloys as corrosion and oxidation resistance materials which possess special electrical properties necessary in instrument making.

The purpose of this research work was the construction of Re-Rh, Re-Ir, and Re-Pd phase diagrams and the establishment of basic rules for the reactions of rhenium with these elements of the platinum group. Data for diagram construction consisted of hardness measurements, melting points, and microscopic and X-ray analyses.

C-O-N-F-I-D-E-N-T-I-A-L

Each of the three systems contains a peritectic isotherm, and it was noted that the greater the difference in melting points of the two pure elements the lower the peritectic transformation temperature and greater extent of the two-phase region. It was also noted that the solubility of rhenium in metals and vice-versa decreases with increasing atomic number of the solute metal.

Powder Metallurgy

41. Boron Nitride Refractory

"Refractory on a Boron Nitride Base," by G. V. Samsonov, Yu. N. Semenov, and P. Ya. Borodulin, Institute of Powder Metallurgy and Special Alloys, Academy of Sciences Ukrainian SSR; Moscow, Ogneupory, No 7, 1962, pp 332-336

A technology for manufacturing a boron nitride refractory based on the nitriding of boron carbide powder is described. A product containing 82-83% boron nitride and 17-18% graphite with a porosity of 18-22% is formed after 2-3 hr at 1,800-1,900° C. The compressive strength of this material at 20° C is 1,000 kg/cm², and the bend strength, 200-230 kg/cm². The coefficient of thermal expansion in the temperature interval of 620-1,070° C is 3.92×10^{-6} . The material begins to oxidize slowly only at temperatures in excess of 1,000° C. It can be easily drilled, machined and atomized. Recommended industrial applications are for linings of aluminum electrolyzers, jackets of thermocouples, and the manufacture of high-purity metals and alloys for semiconductors and also for items of construction operating in highly aggressive fused media.

42. Formation of Hafnium Carbides

"Conditions for the Formation of Hafnium Carbide by Reduction of HfO_2 With Carbon," by V. N. Zhuravkin, T. S. Kutsayev, and B. F. Ormont; Moscow Zhurnal Neorganicheskoy Khimii, Vol. 7, No 8, Aug 62, pp 1762-1764

Relationship of HfC composition to CO temperature and pressure in the bivariant region of the Hf-C-O system was investigated. Conditions for the formation of HfC were found to be in the 1m700-2,600°K interval at 20-1,000 mm Hg with the carbon content closer to the stoichiometric composition in the 2,100-2,600° K range and 20-700 mm Hg interval. A temperature of 2,200° K range and 20-700 mm Hg interval. A temperature of 2,200° K was found to be sufficient for the formation of an oxygen-free carbide and is independent of the CO pressure (in the 20-700 mm Hg interval). Temperatures above 2,300°K and pressure changes at these conditions show no significant effect on the carbide composition.

43. Production of Electrolytic Tantalum, Niobium and Their Alloys

"Production of Electrolytic Tantalum, Niobium, and Their Alloys," by V. I. Konstantinov and V. M. Amosov; Moscow; Tsvetnyye Metally, No 8, Aug 62, pp 72-76

Processes in the industrial production of tantalum and niobium and their alloys in powder form by electrolysis and the treatment of these powders with respect to their final destination are described. Pentoxides of tantalum and niobium and their mixtures containing up to 0.4-0.5% Ti and up to 0.2% Si, in the case of niobium pentoxide alone, serve as the initial raw materials. It is established that alloys of tungsten and molybdenum can also be produced by this method either individually or with tantalum and niobium. The majority of material presented is based on literature of Soviet origin.

44. Reduction of Nickel and Cobalt Hydroxides

"Autoclave Reduction of Nickel and Cobalt Hydroxides With Hydrogen," by G. N. Dobrokhotov, N. I. Onuchkina, and Z. L. Ratner; Moscow, Tsvetnyye Metally, No 8, Aug 62, pp 44-49

Results are given of various tests conducted on the reduction of nickel and cobalt hydroxides in an autoclave with hydrogen. Optimum conditions are established to be at a temperature of 200-250° C and a hydrogen partial pressure of 20-30 atm for a period of 1.0-1.5 hr. Powders obtained under these conditions are highly dispersed and have high catalytic and low cementing activities.

45. Wettability of Aluminum Oxide and Carbides by Metals of the Iron Group

"Certain Data on the Wettability of Aluminum Oxide and Carbides by Metals of the Iron Group," by V. I. Tumanov, V. F. Funke, and L. I. Belen'kaya, Scientific-Research Institute of Hard Alloys; Moscow, Zhurnal Fizicheskoy Khimii, Vol 36, No 7, Jul 62, pp 1574-1577

The surface tension, angle of contact, work of adhesion, and interphase tension of Ni-Mo and Co-W alloys on the solid surface of Al_2O_3 are determined. It is shown that additions of tungsten and molybdenum in quantities up to 10% by atomic weight increase the wettability of Al_2O_3 by nickel and tungsten. Incomplete wetting is observed in the case of TiC and nickel. It is established that two-phase compositions of the WC-TiC system having structurally free WC are wetted more easily by nickel than a WC-TiC solid solution.

Rare Metal Research46. Activity Product of Hafnium Hydroxide

"A Photocolorimetric Method for Determining the pH at Which Solution Begins and Calculating the Activity Product of Hafnium Hydroxide," by P. N. Kovalenko and K. N. Bagdasarov; Moscow; Zhurnal Neorganicheskoy Khimii, Vol 7, № 8, Aug 62, pp 1765-1768

Knowing the pH at which solution begins is of considerable importance in controlling leaching and purification processes of metal salts. Hafnium oxide is, for all practical purposes, insoluble in acids and bases, and treating the dioxide is a time-consuming process which defeats the purpose of finding a rapid chemical method for determining the initial pH. It was found that hafnium will react with the organic reagent "stil'bazo" to form a complex which is stable for approximately 7 days. The resulting solution was used to measure the pH photometrically, after which the solubility product and activity product of hafnium hydroxide were determined. This activity product for the hydroxide was found to be 3.7×10^{-55} at 20°C.

47a. Activity Product of Samarium Hydroxide

"Determination of the pH at Which Solution Begins and the Activity Product of Samarium Hydroxide by the Colorimetric Method," by P. N. Kovalenko and K. N. Bagdasarov; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 7, № 8, Aug 62, pp 1769-1775

The problem of present research is the determination of the pH at which solution begins and precipitation ends for samarium hydroxide. This was carried out by photocolorimetric measurements of the pH of a buffered samarium hydroxide-alizarin S-water solution and subsequent calculation of the samarium hydroxide activity product, which was found to be 0.630×10^{-25} at 20°C. The influence of foreign ions on the initial pH and their removal in the presence of foreign salts were also studied.

47b. Dissociation of Cerium Subgroup Citrates

"Thermographic Study of the Dissociation of Citrates of the Cerium Subgroup," by M. N. Ambrozhiy and Ye. F. Luchnikova; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 7, No 8, Aug 62, pp 1874-1879

A thermographic study was made of the processes involved and products formed in the dissociation of lanthanum, cerium, praseodymium, neodymium, and samarium citrates. It was found that the process proceeds in three stages: (1) removal of water of crystallization, (2) formation of the sesquioxide which is immediately (3) oxidized to the dioxide. The final products of the process were found to be the corresponding oxide of the rare earth element involved.

48. Extraction of Rare-Earth Phenanthroline Salicylates

"A Study of Phenanthroline Rare-Earth Element Complexes in Solution," by L. I. Kononenko and N. S. Poluektov; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 7, No 8, Aug 62, pp 1869-1873

A discussion is presented on the formation of rare-earth-element (Nd, Ho, and Er in this case) chlorides with phenanthroline in water solution into complexes and the extraction of salicylates from ternary complexes of rare-earth-element (Pr, Nd, Ho, and Er) chlorides and phenanthroline with benzene. A study of the adsorption spectra established that the complexes are made up of one atom of metal to two molecules of phenanthroline with the probable formula, in the case of holmium, $[Ho(C_{12}H_8N_2)_2]^{+3}$. It was also concluded that the ternary complex extracted with benzene of a neodymium complex was a neodymium diphenanthroline salicylate with a probable formula: $[Nd_2F][C_6H(OH)COO]_3$, where F is the phenanthroline molecule.

49. Intermolecular Reactions in the Gallium-Tellurium System

"Investigating the Reactions Between Gallium and Tellurium in a Molten State," by S. N. Chizhevskaya and V. M. Glazov; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 7, No 8, Aug 62, pp 1933-1937

This work consisted of studying certain structure-sensitive physical-chemical properties of gallium tellurides and on the basis of this study helping to explain the nature of similar alloys in the liquid state.

By means of conductivity and viscosity measurements at 825, 900, 1,000, and 1,100°C of various Ga-Te compositions, it was possible to deduce that an alloy of eutectic composition in the GaTe-Ga₂Te₃ system can be distinguished by the development of chemical microhomogeneity with microvolumes enriched with either an GaTe or Ga₂Te₃-type compound. With this information, it was then possible to construct a Ga-Te phase diagram to give an adequate representation of the behavior of gallium tellurides and the intermolecular reactions occurring in the Ga-Te system in a liquid state.

50. Liquid-Vapor Equilibrium in the Sulfur-Selenium System

"Liquid-Vapor Equilibrium in the Sulfur-Selenium System," by G. G. Devyatikh, A. I. Odnosevtsev, and V. A. Umilin; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 7, No 8, Aug 62, pp 1928-1932

A number of authors have studied the liquid-vapor equilibrium in the sulfur-selenium system, but the data obtained have been quite inconsistent. This experiment was conducted to measure the distribution of selenium between the liquid and vapor phase and to measure the temperature relationship of the saturated vapor pressure of selenium-sulfur solutions.

In the course of the experiment, it was found that selenium deviates positively and sulfur, negatively, from Raoult's Law. One physical reason used to explain these deviations is the possible incorrect temperature measurements of the boiling sulfur-selenium mixture. Another reason, which is inherent to the system, is the formation of sulfur-selenium molecular mixture.

51. Method for Preparation of Praseodymium and Neodymium Sulfides

"Preparation of Praseodymium and Neodymium Sulfides," by G. V. Samsonov and S. V. Radzikovskaya, Institute of Powder Metallurgy and Special Alloys, Academy of Sciences Ukrainian SSR; Kiev, Ukrainskiy Khimicheskiy Zhurnal, Vol 28, No 4, 1962, pp 444-445

The properties of rare-earth-metal sulfides are interesting from the standpoint of their refractory and semiconductor properties. In the present work, a method is presented for the preparation of praseodymium and neodymium sulfides. According to this method, hydrogen sulfide is passed over portions of Pr₂O₃ and Nd₂O₃ at 0.2 liter/minute at 1,000°-1,100° for 2-3 hours. The resulting sesquisulfides contain insignificant quantities of oxysulfides. The sesquisulfides are then treated with the oxides and carbon in stoichiometric quantities to give the monosulfides.

52. Method for Preparing Pure Indium

"Studying the Process for the Purification of Indium by Electrolysis With Mercury Electrodes," by P. P. Tsyb and V. I. Mal'tsev; Moscow, Zhurnal Prikladnoy Khimii, Vol 35, No 7, Jul 62, pp 1565-1570

Purification of indium is very difficult owing to the fact that there are 15-20 various components to be removed, some of which must not exceed 1×10^{-5} percent in the purified melt. Since the elements have different physical and chemical properties, it becomes difficult to select conditions for purifying the metal from all microimpurities using a minimum number of operations.

The purpose of the present work was to determine the possibility of obtaining pure indium by electrolysis with mercury electrodes, using a multistage electrolyzer. The potentials were determined at which electrolytic decomposition of indium, thallium, and cadmium amalgams in various electrolytes takes place. It was established that the presence of potassium iodine in the electrolyte in the cases of cadmium and thallium causes the potential to become more negative, while the potential of indium remains unchanged. This facilitates separation of cadmium and thallium from indium. The results show that indium may be purified of all possible impurities in one operation by electrolysis with mercury electrodes in a three-stage electrolyzer with potassium iodine. The resulting indium has a purity of 99.9993-99.9998 percent.

52. Neodymium Chloride-Alpha Alanine Reactions

"Reactions of Neodymium Chloride With Alpha-Alanine," by O. Ye. Zvyagintsev and Ye. V. Goncharov; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 7, No 8, Aug 62, pp 1892-1901

The purpose, procedure, and extent of this research is analogous to "Reactions of Neodymium Chloride With Glycine" (see following item). In this work, alpha-alanine is used instead of glycine. The formation neodymium hydroxyalaninate is thought to occur in solutions with a pH of 8.0 and greater. Compounds: $\text{NdCl}_3 \cdot \text{AnH} \cdot 4\text{H}_2\text{O}$, $\text{NdCl}_3 \cdot 3\text{AnH} \cdot 3\text{H}_2\text{O}$, $\left[\text{Nd}(\text{An}) \right] \text{Cl}_2 \cdot 4\text{H}_2\text{O}$, and $\left[\text{Nd}(\text{An})_3 \right] \cdot 2\text{H}_2\text{O}$ were separated for the first time in a free state and investigated by measuring their molar conductivity and by cryoscopic and thermographic methods. (The following is a translation of two consecutive items in the conclusions.) "Complex compounds of alpha-alanine and neodymium chloride formed in solution are less stable than the corresponding complex glycinate compounds. A study of the thermal properties of the crystalline compounds shows a better stability of alpha-alaninate compounds in comparison with the corresponding complex glycinate compounds. Complexes $\text{NdCl}_3 \cdot 3\text{GLH} \cdot 3\text{H}_2\text{O}$ where GLH is the glycinate molecule and $\text{NdCl} \cdot 3\text{AnH} \cdot 3\text{H}_2\text{O}$ appear to be exceptions."

54. Neodymium Chloride-Glycine Reactions

"Reactions of Neodymium Chloride With Glycine," by O. Ye. Zvyagintsev and Ye. V. Goncharov; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 7, No 8, Aug 62, pp 1880-1891

The goal of this work was to investigate fully the reactions of rare-earth elements with amino acids with a specific idea of reacting neodymium chloride with glycine. Data from the reactions consisted of measuring the pH, specific electrical conductivity, and optical density of various solutions while increasing alkalinity of the solutions in stages. No reactions were observed in dilute solutions. Only in highly concentrated solutions were crystals precipitated. The mechanism of the reactions is apparently due to the high alkalinity which causes the glycine to become reactive with respect to the neodymium cation and is manifested by the appearance of the $\text{NH}_2\text{CH}_2\text{COO}-1$ ion. Formation of the neodymium hydroxyglycinate is believed to occur at a pH of 8.0-9.0. For the first time, compounds with the following composition were obtained: $\text{NdCl}_3 \cdot 3\text{NH}_2\text{CH}_2\text{COOH} \cdot 3\text{H}_2\text{O}$, $\left[\text{Nd}(\text{NH}_2\text{CH}_2\text{COO}) (\text{H}_2\text{O})_4 \right] \text{Cl}_2 \cdot \text{H}_2\text{O}$, and $\left[\text{Nd}(\text{NH}_2\text{CH}_2\text{COO})_3 \right] \cdot 3\text{H}_2\text{O}$.

55. New Process for Recovery of Tellurium and Selenium From Sulfuric Acid Sludge

"Extraction of Selenium and Tellurium From Sulfuric Acid Sludge by the Method of Chlorination in a Nonaqueous Medium," by G. Kh. Efendiayev and R. A. Alckperov, Institute of Chemistry, Baku, Doklady Akademii Nauk Azerbaydzhanskoy SSR, Vol 18, No 5, 1962, pp 15-20

Pyrite ores used for the production of sulfuric acid contain considerable quantities of selenium and tellurium in the form of oxides. During the process, these oxides pass on along with the sulfur dioxide and are deposited in various parts of the gas purifying system, thereby forming sludges rich in these elements. It has been established that these elements exist in the sludges predominantly in the free state.

Several methods exist for the extraction of selenium from sludges, and some of them have been applied industrially. In aqueous medium, selenium is oxidized with hypochlorous acid and not chlorine. Both selenous and selenic acids are formed. The latter interferes with complete separation of selenium by reduction.

In the present work, a scheme was devised for the simultaneous separation of selenium and tellurium which lacks the above disadvantage. According to this method, the sludge is suspended in carbon tetrachloride and chlorinated in the absence of water. The resulting selenium and tellurium tetrachlorides are crystalline substances which are insoluble in carbon tetrachloride and are readily separated.

56. Solid State Solubility of Neodymium and Cerium in Magnesium

"Solubility of Neodymium and Cerium in Magnesium in the Solid State," by L. L. Rokhlin; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Metallurgiya i Toplivo, No 2, Mar/Apr 62, pp 126-130

The solubility of neodymium and cerium in magnesium was investigated by measuring the resistivity of various compositions of the two elements in magnesium at various temperatures in the solid state and making chemical analyses on the quenched samples. Results of the experiment are shown below:

<u>Element</u>	% Solubility (by weight) at Temperature °C							<u>T*</u>
	<u>200</u>	<u>300</u>	<u>400</u>	<u>500</u>	<u>540</u>	<u>580</u>		
Nd	0.08	0.16	0.70	2.20	3.20	--	3.6*	
Ce	0.04	0.06	0.08	0.26	0.38	0.66	0.74*	

*T is temperature of the eutectic composition which is 522°C for Nd and 590°C for Ce. Both the temperatures and solubility percent at the eutectic point were determined by extrapolation of the solubility curves and the curves formed by noting the absence and presence of grain boundary fusion.

57. Study of the Scandium Oxide-Silicon Oxide System

"Phase Diagram of the Scandium Oxide-Silicon Oxide Binary System," by N. A. Toropov and V. A. Vasil'yeva; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 7, No 8, Aug 62, pp 1938-1945

This work was carried out to investigate the $\text{Sc}_2\text{O}_3\text{-SiO}_2$ system and determine the existence of any and all compounds formed. X-ray analysis and microphotograph studies revealed that the system contains two compounds, three eutectic points, and a wide region consisting of two immiscible liquids.

Scandium silicate, by virtue of its stoichiometric composition, high melting point, and tendency to segregate, is similar to silicates of the rare-earth metals. The metastability of scandium orthosilicate can be explained from the viewpoint that scandium is analogous to aluminum which does not form compounds of this type.

58. Vapor Density of Hafnium Tetrachloride at High Temperatures Measured

"Study of the Vapor Pressure of Hafnium Tetrachloride at High Temperatures," by V. I. Tsirel'nikov, L. M. Komissarova, and Academician V. I. Spitsym, Moscow State University; Moscow, Doklady Akademii Nauk SSSR, Vol 145, No 5, 11 Aug 62, pp 1081-1084

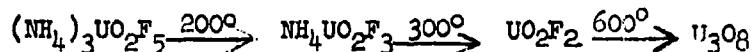
The vapor density of hafnium tetrachloride was measured under various conditions using a tracer atom technique. Hafnium tetrachloride labeled with Hf^{181} was used. Vapor density measurements were made at various temperatures from 395° to 1,000°C at 0.5, 1.0, and 1.15 atmospheres constant pressure. Measurements were also made at various pressures between 100 and 1,240 millimeters of mercury at 398°, 467°, and 865°C constant temperature. At high temperatures and low pressures, hafnium tetrachloride vapor behaves according to ideal gas laws, within the limits of experimental error. At pressures above one atmosphere and at temperatures approaching the sublimation point, hafnium tetrachloride vapors depart from ideal behavior.

Uranium Compounds Research59. Decomposition of Ammonia Uranyl pentafluoride to Form U₃O₈

"Some Physical and Chemical Properties of Ammonia Uranyl pentafluoride," by N. P. Galkin, U. D. Veryatin, and V. I. Karpov; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 7, No 8, Aug 62, pp 2020-2022

Uranium fluoride compounds have been widely studied and used in uranium processes; however, some uranium compounds such as ammonia uranyl pentafluoride and ammonia uranyl peroxyfluoride have not been sufficiently studied. This study involved heating samples of ammonia uranyl pentafluoride at different rates and observing their endo- and exothermic effects and weight loss during the heating process.

Thermogravimetric analysis showed that the pentafluoride is stable up to 100°C. From 400° to 600°C, the uranyl fluoride exists which subsequently decomposes into uranous and uranic oxide above 600°C. The entire process of decomposition is assumed to proceed according to the following reaction:

60. Precipitation of Uranyl Phosphates

"A Study of Uranyl Phosphate Precipitation Processes," by V. I. Karpov and V. G. Bakhurov; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 7, No 8, Aug 62, pp 1842-1845

Purpose of the present work was to study the mechanisms involved in the formation of uranyl phosphates and to explain the interrelationship of uranyl phosphates in an ionic solution in order to draw certain conclusions about the genesis of natural uranyl phosphates. Titration experiments showed that the formation of uranyl phosphates was a function of the titration reagent and its pH. Comparisons were made on natural and synthetic uranyl phosphates.

61. Properties of Uranyl Phosphates

"Investigation of Some Physical and Chemical Properties of Uranyl Phosphates," by V. I. Karpov and Ts. L. Ambartsumyan; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 7, No 8, Aug 62, pp 1838-1841

The physical and chemical properties of four uranyl phosphates [$\text{NH}_4\text{UO}_2 \cdot 3\text{H}_2\text{O}$, $\text{NaUO}_2\text{PO}_4 \cdot 3\text{H}_2\text{O}$, $\text{UO}_2\text{HPO}_4 \cdot 4\text{H}_2\text{O}$, and $(\text{UO}_2)_3(\text{PO}_4)_2 \cdot 6\text{H}_2\text{O}$] were investigated by a study of thermographic and thermogravimetric curves, luminescence, color, and photomicrographs. It was found that these particular phosphates possess a number of characteristic properties which can be utilized for qualitative analyses.

62. Three-Phase Separation of Uranium Oxide

"Three-Phase Separation in the $\text{UO}_2(\text{NO}_3)_2\text{-HNO}_3\text{-H}_2\text{O-DAMFK}$ (Diisooamylmethylphosphonate)-Kerosene System in the Presence of Oxalic Acids," by K. P. Lunichkina, N. S. Povitskiy, and A. S. Solovkin; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 7, No 8, Aug 62, pp 2019-2020

It has been proven that in the $\text{UO}_2(\text{NO}_3)_2\text{-HNO}_3\text{-H}_2\text{O-DAMFK-Kerosene}$ system the formation of a third phase is not dependent on the uranyl nitrate concentration in the equilibrium water solution. The purpose of the present work was to determine the composition of the compound(s) extracted into the third phase.

Analysis of the third phase showed it to contain 19.9% UO_2 , 5.5% NO_3 , 5.8% C_2O_4 , 52.8% DAMFK, and 0.4% water, which are in a ratio of (water negligible) 1:1.2:0.89:2.64, respectively. From the ratio it is evident that the composition of the third phase corresponds to the empirical formula $\text{H}\left[\text{UO}_2(\text{NO}_3)(\text{C}_2\text{O}_4)\right] \cdot n \text{ DAMFK}$.

Miscellaneous63. Assembly of a Continuous "Tube-Growing" Machine Nearing Completion

"Continuous Tube Casting Method"; Moscow, Pravda, 7 Sep 62, p 1

Assembly of a continuous "tube-growing" machine is claimed to be nearing completion at the Mogilev Plant imeni Myasnikov. The operating principle of this machine consists basically of pulling a continuously crystallizing shell from a water-cooled crystallizer in which the level of molten metal is maintained automatically at a predetermined level. Tubes are pulled at rates up to 30 m/hr. No other details are given.

64. Bibliography on Crystallography

"International Union for Crystallography. Commission for Crystal Structure Data. A List of Works for 1959 Containing New Data About Crystal Structures"; Moscow, Zhurnal Strukturnoy Khimii, Vol 3, No 4, Jul/Aug 62, pp 501-512

This bibliography contains 478 references on the crystallography of metal and alloy systems, of which 120 are USSR publications.

65. Diffusion of Semiconductor Impurities Studied

Methods for Evaluating the Coefficients of Diffusion of Impurities in Molten Semiconductor Silicon," by B. M. Turovskiy, Institute of the Rare-Metal Industry; Moscow, Zhurnal Fizicheskoy Khimii, Vol 36, No 8, Aug 62, pp 1815-1818

Formulas are derived for calculating the coefficients of diffusion of impurities in molten semiconductor silicon. The diffusion coefficients for aluminum, phosphorus, and arsenic in molten silicon are, respectively, 2.28×10^{-5} , 2.31×10^{-4} , and $2.36 \times 10^{-4} \text{ cm}^2/\text{sec}$. These values may be used for calculating the effective coefficients of distribution of these impurities in silicon under any process conditions for growing crystals. Methods are developed which may be used to evaluate the coefficients of diffusion of impurities in other semiconductors and pure metals.

66. East German Plasma Torch

"Plasma Torch"; Budapest, Nepszeru Technika, Vol 9, No 8, Aug 62, inside front cover

At the request of the Nuclear Research Institute of Berlin, Professor von Ardenne and his colleagues developed a simple, easy-to-handle plasma torch. The plasma flame has a temperature of 15,000 - 20,000° C. The new torch has many uses. In Dresden, it is being used to cut thick aluminum sheet. It can be used to deposit protective coatings of rare and refractory metals, to produce monocrystals and heating filaments from high-purity substances, to temper surfaces and for chemical synthesis.

67. Electrodeposition of a Chromium-Molybdenum Alloy

"Investigation of the Process of Electrodeposition of a Chromium-Molybdenum Alloy," by G. N. Tomashova and A. T. Vagramyan, Institute of Physical Chemistry, Academy of Sciences USSR; Moscow. *Zhurnal Fizicheskoy Khimii*, Vol. 36, No 7, Jul 62, pp 1445-1449

Electrodeposition of a chromium-molybdenum alloy from aqueous solutions of chromic acid with additions of ammonium molybdate and sulfuric acid of various concentrations at a current density of 500 milliamps/cm² and room temperature is investigated. A platinum plate was used as the cathode and an insoluble electrode (graphite, lead) as the anode. The low-current efficiency of the process was determined to be connected with the low overvoltage of the hydrogen on this alloy. The curve for the dependence of the percent composition of molybdenum in the alloy on the concentration of sulfuric acid passes through a maximum which corresponds to 2-2.5 g/l H₂SO₄.

68. Heat Treatment of Certain Alloys of Aluminum With Zinc, Magnesium, and Copper

"The Effect of Heat Treatment on the Properties of Alloys of Aluminum With Zinc, Magnesium, and Copper," by I. N. Nesterovich, *Sbornik Nauchnykh Trudov. Fiziko Tekhnicheskii Institut, Akademii Nauk Belorusskoi SSR*, No 6, 1960, pp 106-113 (from *Referativnyy Zhurnal -- Mashinostroyeniye*, No 15, Aug 62, Abstract No 15A132)

A study is made of the effect of the holding period (10-120 min) and heating temperature for quenching (440-480°C) and also the temperature and duration of the aging period (120, 130, and 140°C for 5-40 min) on the mechanical properties (tensile strength, elongation and H_B) of alloys of Al with Mg (3-4%), Zn (8-10%), and Cu (1.5%). It is established that in order to ensure optimal properties, the quenching temperature should be maximum; the recommended holding period is 40 min. High strength and hardness is achieved by age hardening at 130°C for 15-20 min. Alloys of aluminum with 80% Zn, 3% Mg, and 1.5% Cu have a tensile strength of 75 kg/mm² and elongation of 7% after treatment under the above-mentioned conditions.

69. Manufacture of Thin, High-Strength, Copper-Coated Wire

"Study of an Electrolytic Method of Making High-Strength, Thin, Bimetallic Copper-Steel Wire," by V. Gurylev; Chelyabinsk, Trudy Konferentsii po Metiznomu Proisvodstvu, 1959, 1961, pp 305-308.
(from Referativnyy Zhurnal -- Khimiya, No 13, 10 Jul 62, Abstract No 13KL73)

"It is established that an electrolytic method can be used for the manufacture of high-strength, thin, copper-steel wire (diameter of 0.15 mm and tensile strength of 220 kg/mm²). Copper is deposited on a patented wire (blank) and then drawn to the required diameter."

70. Niobium Chloride-Rubidium and Cesium Chloride Reactions

"Study of the Reactions Between, Niobium Chlorides and Rubidium and Cesium Chlorides in Melts," by V. V. Safonov, B. G. Korshunov, and Z. N. Shevtsova; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 7, No 8, Aug 62, pp 1979-1982

The study of the physical and chemical properties of niobium chlorides and their melts with alkali metal chlorides has created much scientific and practical interest which led to the purpose of the present work.

The NbCl₄-RbCl and NbCl₄-CsCl systems were studied by means of crystallization curves and phase diagrams from which it was found that both systems behave similarly. In the NbCl₄-RbCl system, the compound Rb₂NbCl₆ is formed at 67-mole percent and has a melting point at 802°C; an eutectic point is found at 83-mole percent RbCl-630°C. In the NbCl₄-CsCl system, compound Cs₂NbCl₆ is formed at 67-mole percent RbCl which melts at 822°C, and the eutectic point is at 90-mole percent CsCl at 595°C, plus a phase change at 452°C from CsNbCl₆ + - CsCl to CsNbCl₆ + α-CsCl.

It was concluded that niobium occurs in the molten state of both systems as the [NbCl₆]⁻² ion, but in the NbCl₄-CsCl system there is evidence that niobium occurs in the form of two different complex ions, [NbCl₅]⁻¹ and [NbCl₆]⁻².

71. Recrystallization of Nickel-Gold Alloys

"Kinetics of Recrystallization in Nickel-Gold Alloys," by V. V. Sanadze and G. V. Gulyayev, Georgian Polytechnic Institute imeni V. I. Lenin; Tomsk, Izvestiya Vysshikh Uchebnykh Zavedeniy. Fizika, No 2, 1962, pp 15-20

Recrystallization processes in Ni-Au alloys containing from 2.3 to 19.5% Au by weight are examined. Curves are constructed showing the concentration dependence of initial and final crystallization temperatures and of the activation energy of initial recrystallization. It is established that enrichment of the crystal lattice of nickel with gold atoms increases the binding forces and elevates the initial and final recrystallization temperatures.

72. Review of Whisker Research

"Strength and Plastic Properties of Whisker Crystals," by I. A. Oding and I. M. Kop'yev, Trudy Instituta Metallurgii, Akademii Nauk SSSR, No 8, 1961, pp 252-258 (from Referativnyy Zhurnal-- Mashinostroyeniye, No 9, May 62, Abstract No 9A91)

Literature on the history, methods of obtaining, and the mechanical properties of metal whiskers is reviewed. Results are presented on investigations of the strength properties of iron and copper whiskers (stress-strain diagrams and data on the effect of the dimensions of whiskers on their strength and on X-ray investigations). It is established that the strength of whiskers is near the theoretical and increases with decrease of the diameter and length of the whiskers.

73. Temperature Distribution in Zone Recrystallization

"Temperature Distribution in a Rod During Zone Recrystallization Without a Crucible," by I. V. Milov, V. V. Okinshevich, and D. M. Skorov; Moscow, Izvestiya Akademii Nauk SSR, Otdeleniye Tekhnicheskikh Nauk, Metallurgiya i Teplovo, No 2, Mar/Apr 62, pp 56-62

A study is made of the power needed for zone remelting without a crucible the relationship between the power supplied, and the width of the zone melted.

A mathematical method of studying the temperature distribution is discussed. A method is given for calculating the necessary power for a narrow melted zone. The configuration of the molten edge of the zone is examined.

Seminar on Titanium

74. Third Seminar on Titanium Alloys To Be Held in 1963

"Second Seminar on Theoretical and Experimental Investigations of Titanium Alloys," by S. G. Fedotov; Moscow, Izvestiya Akademii Nauk SSR, Otdeleniye Tekhnicheskikh Nauk, Metallurgiya i Toplivo, No 4, Jul/Aug 62, pp 189-191

The Second Seminar on Theoretical and Experimental Investigations of Titanium Alloys, organized by the Laboratory of the Chemistry of Metal Alloys of the Institute of Metallurgy imeni A. A. Baykov, was held on 9-12 March 1962 at the institute (Moscow).

The article notes that the next regular seminar will be held in March 1963.

Works of the First Seminar on the Chemistry of Titanium and New Titanium Alloys were published in the collection Titan i yego splavy (Titanium and Its Alloys), Publishing House of the Academy of Sciences USSR, No 7, 1962.

* * *

UNCLASSIFIED
Central Intelligence Agency



Washington, D.C. 20505

7 September 2004

Ms. Roberta Schoen
Deputy Director for Operations
Defense Technical Information Center
7725 John J. Kingman Road
Suite 0944
Ft. Belvoir, VA 22060

Dear Ms. Schoen:

In February of this year, DTIC provided the CIA Declassification Center with a referral list of CIA documents held in the DTIC library. This referral was a follow on to the list of National Intelligence Surveys provided earlier in the year.

We have completed a declassification review of the "Non-NIS" referral list and include the results of that review as Enclosure 1. Of the 220 documents identified in our declassification database, only three are classified. These three are in the Release in Part category and may be released to the public once specified portions of the documents are removed. Sanitization instructions for these documents are included with Enclosure 1.

In addition to the documents addressed in Enclosure 1, 14 other documents were unable to be identified. DTIC then provided the CDC with hard copies of these documents in April 2004 for declassification review. The results of this review are provided as Enclosure 2.

We at CIA greatly appreciate your cooperation in this matter. Should you have any questions concerning this letter and for coordination of any further developments, please contact Donald Black of this office at (703) 613-1415.

Sincerely,

Nancy J. Alcivar

Sergio N. Alcivar
Chief, CIA Declassification Center,
Declassification Review and Referral
Branch

Enclosures:

1. Declassification Review of CIA Documents at DTIC (with sanitization instructions for 3 documents)
2. Declassification Status of CIA Documents (hard copy) Referred by DTIC (with review processing sheets for each document)

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Processing of OGA-Held CIA Documents

The following CIA documents located at DTIC were reviewed
by CIA and declassification guidance has been provided.

OGA Doc ID	Job Num	Box	File#	Doc ID	Document Title	Pub Date	Pages	Decision	Proc Date	
AD0463342	78-03109A	55	1	2	88	4/1/1965	190	Approved For Release	3/25/2004	
AD0465168	78-03109A	55	1	3	89	5/1/1965	245	Approved For Release	3/25/2004	
AD0467068	78-03109A	55	1	4	90	6/1/1965	221	Approved For Release	3/25/2004	
AD0468849	78-03109A	55	1	5	91	7/1/1965	218	Approved For Release	3/25/2004	
AD0471155	78-03109A	55	1	6	92	8/1/1965	236	Approved For Release	3/25/2004	
AD0473500	78-03109A	55	1	7	93	9/1/1965	221	Approved For Release	3/25/2004	
AD0474384	78-03109A	55	1	8	94	10/1/1965	181	Approved For Release	3/25/2004	
AD0475860	78-03109A	55	1	9	95	11/1/1965	305	Approved For Release	3/25/2004	
AD0477388	78-03109A	56	1	1	96	12/1/1965	181	Approved For Release	3/25/2004	
AD0478471	78-03109A	56	1	2	97	1/1/1966	198	Approved For Release	3/25/2004	
AD0479675	78-03109A	56	1	3	98	2/1/1966	354	Approved For Release	3/25/2004	
AD0481681	78-03109A	56	1	4	99	3/1/1966	237	Approved For Release	3/25/2004	
AD0334379	78-03117A	191	1	37	4255	1/29/1963	53	Approved For Release	3/29/2004	
					Status And Activities Of Prominent Scientists In Communist China In 1962					
AD0333974	78-03117A	190	1	35	4212	1/17/1963	27	Approved For Release	3/29/2004	
AD0335202	78-03117A	195	1	13	4394	3/13/1963	27	Approved For Release	3/25/2004	
AD0332657	78-03117A	183	1	13	3924	10/12/1962	76	Approved For Release	3/29/2004	
AD0333147	78-03117A	185	1	30	4020	11/16/1962	90	Approved For Release	3/29/2004	
AD0333427	78-03117A	188	1	13	4112	12/13/1962	84	Approved For Release	3/29/2004	
AD0334160	78-03117A	190	1	10	4187	1/10/1963	69	Approved For Release	3/29/2004	
AD0334612	78-03117A	193	1	10	4310	2/20/1963	112	Approved For Release	3/29/2004	
AD0335309	78-03117A	195	1	32	4413	3/20/1963	110	Approved For Release	3/29/2004	
AD0336242	78-03117A	198	1	16	4509	4/12/1963	81	Approved For Release	3/29/2004	
AD0332575	78-03117A	184	1	6	3957	Scientific Information Report Chemistry And Metallurgy (22)	47	Approved For Release	3/29/2004	
AD033164	78-03117A	187	1	2	4061	Scientific Information Report Chemistry And Metallurgy (23)	11/28/1962	65	Approved For Release	3/25/2004
AD0333857	78-03117A	189	1	22	4160	Scientific Information Report Chemistry And Metallurgy (24)	1/2/1963	57	Approved For Release	3/29/2004
AD0334310	78-03117A	191	1	20	4238	Scientific Information Report Chemistry And Metallurgy (25)	1/28/1963	52	Approved For Release	3/29/2004